Remarks

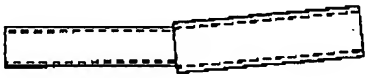
Response to Claim Rejections – 35 USC P 103

With respect to Claim 1:

Addressing aspects of McHugh and Fuoss: Applicant generally agrees with examiner's characterization of McHugh. McHugh and Bettinger are both sliding joints that allow axial expansion and contraction during operational life when filled with a fluid media. McHugh functions as a hot gas exhaust pipe. Bettinger functions as cryogenic rocket engine piping. Hand packing of sealing material is sufficient for low pressures in McHugh. Bettinger requires a positive externally pressurized seal for high pressures and differential temperatures of from ambient to –253 degrees F for liquid hydrogen.

Fuoss indeed teaches a pipe connection comprising two overlapping pipes with a tensioned band "particularly for connecting exhaust pipes of an internal-combustion engine." However, Fuoss has

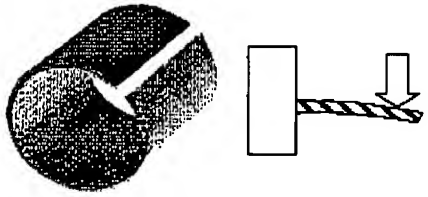
a. a short overlap precluding any sliding contact,
b. non-axial fitting-up during assembly,
c. an angle to form between the pipes,
d. a metal to metal joint after assembly, and
e. an immovable joint in/during operation.



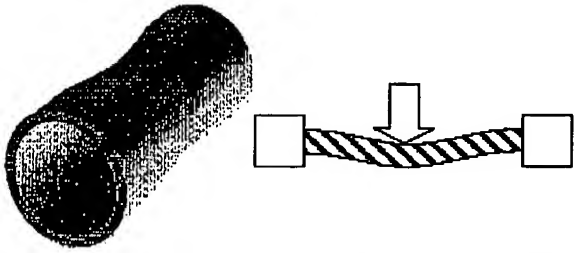
Bettinger also has two overlapping pipes with a tensioned band. In comparison to Fuoss, Bettinger has

a. a substantial overlap to provide for sliding guidance,
b. allows only axial assembly,
c. forced direct axial expansion and contraction,
d. a joint where the pipe materials (composites) have no contract, and
e. a moveable joint during operation.

Fuoss applies the force in the tensioned band to a "slotted flexible ring with a spherical outer contour between the exterior pipe and the interior pipe" shown in his Figure 1 as 3. In this same figure the pipe 2 is shown to be continuous at 4 and slotted at 5. The tensioning of Fuoss does not cause deflection or deformation of the outer pipe 2 it only closes the slot in the pipe by a small incremental cantilever flexure as shown below. Any loosing of the tension band of Fuoss causes the joint to fall apart.



Fuoss – Slot & Cantilever



Bettinger – Circumferential Deflected Pipe & Fixed End Beam

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Bettinger applies the force in the tensioned band to compress and deflect the pipe inward by elastic deformation as show above. The pipe necks inward. Each longitudinal increment of the pipe acts as a fixed-end beam being deflected by the circumferential force. Bettinger can vary the deflection by adjusting the force. Fuoss cannot.

Fuoss does not possess packing material within his teaching. Bettinger makes the compression of packing material central to his teaching for maintaining pressure during pipe movement.

With regard to examiner's note: It was noted that it only takes Fuoss's clamp about McHugh's device to produce a Bettinger device. We disagree. How can a component used for fixing a joint be conceived as an obvious remedy for an expansion joint? Where along the length of McHugh would the clamp be applied? How much deflection of McHugh's pipe will be required? Would not the tension band produce a fixed joint?

Fuoss uses a tension band for fixing a joint. Joining of components into a fixed assembly is the common use of circumferential tension bands. A hose clamp deforms a hose to fix it to a fitting. A rubber band deforms a roll of drawings to keep them from unrolling and to fix their diameter. Bettinger uses a tension band to enable a movable expansion joint.

Fuoss has only two general commonalties with Bettinger, a tension band and pipes. From the discussion above we see that the tension band is different and the pipes have a different relationship.

Response to 35 USC 103 per 706.02(j)

Suggestion/Motivation: Applicant stipulates that there exists a strong motivation to seal pipe joints from leakage under even moderate pressure. Applicant also stipulates that there exists a strong motivation to solve the seal problem by putting external pressure on an O ring or packing ring. Motley in US Patent No. 6,283,156 details three types of O ring seals in the prior art as shown in his patent as extracted below. Motley then teaches a method of using a grease-gun to put hydraulic pressure on an O ring to force sealing action when the pipe contains fluid pressure. This is a well researched area of piping technology. Yet, no suggestion has been made to deflect an un-slotted pipe sufficiently to put pressure on an internal flexible, elastic, or visco-elastic sealing media for a conformal resistance to fluid pressure in a fixed joint, **much less applied such a concept to an expansion joint.**

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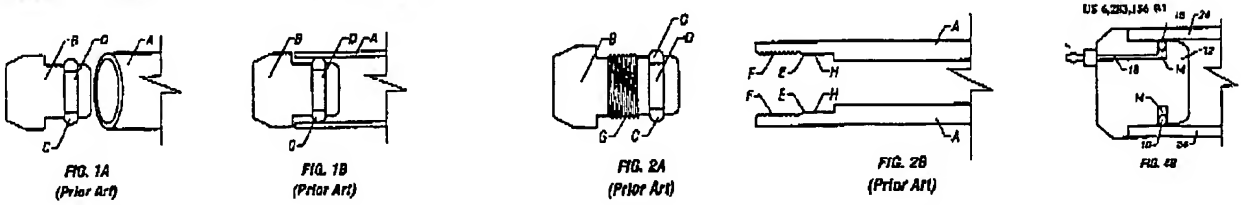

FIG. 1A (Prior Art) FIG. 1B (Prior Art) FIG. 2A (Prior Art) FIG. 2B (Prior Art) FIG. 4B

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Expectation of Success: The discussion of Fuoss above details the great distance between the common, ingrained, learned concept of a tension band to fix components to each other versus the use of externally pressurized internal packing material by a tension band for an expansion joint in the current application.

Claim Limitations and Distinctions of Bettinger: McHugh in the light of Fuoss

McHugh Claim Attributes	Corresponding Bettinger Claim 1 Attributes
1. Outer fluid conduit	Outer pipe member
Inner fluid conduit	Inner pipe member
Slidable disposed	Telescopically arranged (axial sliding)
Two retainer rings	
Third retainer ring	
Slidable compression ring	
Packing material between rings	Cylindrical resilient & elastic seal
Wherein packing provides	
Fluid-tight seal	Fluid-tight seal
Spacing between tubes	
Vibration damping	
2. & 3. Spacing between rings & tubes	
4. Attachment ring	
5. Vibration	
6. Packing gland	
7. Third retainer ring	
8. Fluid & vibration	
9. No contact	
10. Bladders	
11. Attachments	
12. Thickness	
13. Gland	
14. Spaced rings	
15. Equal ID	

Fuoss Claim Attributies

Inner & Outer Pipes		Inner & Outer Pipes
Tension Band		Tension Band
	Distinction 1	Positioned over elastic seal
	Distinction 2	Force/tension selected
	Distinction 3	Radially deflect outer pipe
	Distinction 4	Radially compress & deflect seal material
	Distinction 5	Bearing & friction-loaded fluid seal
	Distinction 6	Varying temperature
	Distinction 7	Rotational relative movement

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Amend Specification

In order to clarify the specification and bring it in line with the drawings the following amendment is offered to – Detailed Description – First paragraph.

In Figure 1 a compressed seal expansion joint is shown comprising at least one generally cylindrical resilient and elastic seal 1 disposed in an annular packing chamber defined between telescopically arranged outer 2 and inner 3 pipe members and an outer circumferentially tensioned band and clamp 4 positioned longitudinally **over the generally cylindrical resilient and elastic seal 1** *and selected to produce a compressive force 5 to radially deflect the outer pipe member and thereby compress and deflect the generally cylindrical resilient and elastic seal with a deflection shown at 6 so that the outer and inner pipe members and the generally cylindrical resilient and elastic seal create and maintain a bearing and static and dynamic friction-loaded sealed relationship between the generally cylindrical resilient and elastic seal and outer and inner pipe member surfaces 7, 8 for fluid flow at varying temperatures between adjacent ends of two conduits 9, 10 during axial sliding 11 and rotational 12 relative movement of the outer and inner pipe members 2, 3.*

Amend Claim 1 to further clarify

1. A compressed seal expansion joint comprising:

at least one generally cylindrical resilient and elastic seal disposed in an annular packing chamber defined between
telescopically arranged outer and inner pipe members, and
an outer circumferentially tensioned band and clamp positioned ***over said generally cylindrical resilient and elastic seal*** *and selected to produce a compressive force to radially deflect said outer pipe member and thereby compress and deflect said generally cylindrical resilient and elastic seal so that said outer and inner pipe members and said generally cylindrical resilient and elastic seal create and maintain a bearing and friction-loaded sealed relationship for fluid flow at varying temperatures between adjacent ends of two conduits during axial sliding and rotational relative movement of said outer and inner pipe members.*

With respect to claims 2 and 3:

Since claim 1 has been upheld in its amended form above the question of claims 2 and 3 would appear to be moot. However the second set of claim 1 components have a motivation for the applicant in that they serve to further limit the device to only axial and rotational telescoping movement. Thus the device is duly modified by this addition (See Morris 5,323,091).

With respect to claim 4:

Since claim 1 has been upheld in its amended form above the question of claim 4 would appear to be moot. However, this claim is necessary to the proper teaching of assurance of fluid seal, and resistance to vibration in an expansion joint. McHugh teaches that the selection of thickness of packing is the necessary attribute. McHugh refers to the means, thickness of seal, without defining how that thickness can be adjusted by manual or mechanical means. Bettinger teaches that " the static compressive frictional forces on the contact surfaces of ...seals,..guide rings, and ...pipe members" is necessary to resist and prevent relative movement..." And the present application teaches the means "by external circumferential force."

With respect to claim 5:

Since claim 1 has been upheld in its amended form above the question of claim 5 would appear to be moot. However, examiner has quoted In re Leschin 125 USPQ 416 to support a rejection based on obvious substitution of materials. Applicant disagrees since no expansion joint exists for PMC materials. Applicant has stated that an object is cryogenic piping. Where large temperature excursions occur, the joining of PMC pipe to metal pipe is unworkable due to the differences in coefficient of thermal expansion. Barring some new innovative pipe joint, PMC should be joined to PMC pipe.

In this case the need for an expansion joint for PMCs was the basic drive of the applicant to create the current invention. Yes, McHugh in the light of Fuoss could have been built out of PMCs. But it would not have had the distinctions of the present application because the present application grew out of the need for a PMC expansion joint that was materials-compatible with other PMC piping components. In re Leshin does not apply because this was not mere material selection based on attributes, but the material was the entire basis for the teaching.

With respect to claims 6 and 7:

Since claim 1 has been upheld in its amended form above the question of claims 6 and 7 would appear to be moot.

With respect to claim 8:

Since claim 1 has been upheld in its amended form above the question of claim 8 would appear to be moot.

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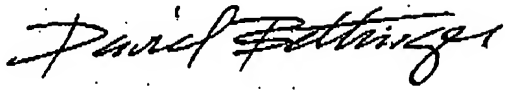
Respectfully submitted,



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